REMARKS

Rejected claims 8 and 24 have been cancelled without estoppel or disclaimer of the subject matter thereof.

Claims 1-7, 11, 12, 17-23, 27 and 28 have been rejected under 35 U.S.C. §102(b) as being anticipated by Tolonen. This rejection is respectfully traversed with respect to these claims as amended herein.

The independent claims 1 and 17 as amended herein now variously recite the apparatus and process including "an error calculator for calculating an error in an amplitude/phase space between the spectrum of said input signal and the spectrum of the sum of said one or more unit signals", and "means for iteratively altering said parameters of the unit signals and for having said error calculator recalculate the error until the parameters of the unit signals that provide minimum error are determined".

Also, independent claims 5 and 21 variously recite the apparatus and process including "a local layer for performing instantaneous encoding based on said spectrum to determine local feature parameters including frequencies, amplitudes and time variation thereof of the center frequencies of said frequency component candidate points", and "a harmonic calculation layer for grouping the frequency component candidate points having a same harmonic structure that is determined by the local feature parameters including the frequency and its time

variation rate of the frequency component candidate points, and then calculating a fundamental frequency of the harmonic structure, variations of the fundamental frequency, harmonics contained in the harmonic structure, and variations of the harmonics", and "a pitch continuity calculation layer for calculating a continuity of signal using the fundamental frequency and the variation of the fundamental frequency calculated by said harmonic calculation layer".

In addition, the dependent claims are further limited by various recitations of generating a number of unit signals responsive to the number of local peaks of power spectrum for the input signal, or formulaic representation of the unit signal in terms of time variations of instantaneous amplitudes and frequencies, or encoding layers for calculating frequencies, amplitudes, and variations of frequencies, and amplitudes at frequency component candidate points.

These aspects of the claimed invention are not disclosed or even suggested by Tolonen. Specifically, in Section 2 Iterative Analysis, 2nd paragraph reads "In each iteration, the most prominent sinusoid is first detected. ...the prominence criterion is the energy of the residual signal, i.e., the aim is to select a sinusoid which minimizes the energy of the residual signal that is obtained by subtracting the synthesized sinusoid from the original one."

The 3rd paragraph reads, "After the most prominent component is detected, its parameters are estimated. Using the estimated parameters, a representation of

the sinusoid is synthesized and removed from the previous residual signal or the original signal in the first iteration. The removal is typically performed by subtracting the synthesized sinusoid from the residual of the previous step in the time or the frequency domain, depending on the parameterization. Naturally, if time-domain subtraction is used, a new DFT representation is required in each recursion. The recursion is continued until all significant components have been detected and removed."

Thus, contrary to the Examiner's analysis of this reference, the error calculation according to the claimed invention does not correspond to "residual" calculation in Tolonen. Instead, the "error" as claimed is a difference between the input signal and the sum of the unit signals in each iteration, the iteration being carried by altering the parameters of the unit signals and having the error calculator recalculate the error until the parameters of the unit signals that provide minimum error are determined. At best, an iteration in Tolonen is performed such that a representation of the sinusoid is synthesized and removed from the previous residual signal or the original signal in the first iteration, the removal being performed by subtracting the synthesized sinusoid from the residual of the previous step. That is, in Tolonen, the residual in each iteration is a difference between the representation of the sinusoid in the current step and the residual of the previous step that is not the same as the input signal or the original. Thus,

Tolonen fails to teach the scheme as claimed by Applicants of altering the parameters of the unit signals in each iteration and having the error calculator recalculate the error until the parameters of the unit signals that provide minimum error are determined.

Additionally, in the claimed invention, the local layer determines based on the spectrum determined by frequency analysis frequency, amplitude and time variation thereof of the frequency component candidate points as local feature parameters. The harmonic calculation layer performs grouping of the frequency component candidate points having a same harmonic structure as determined by the local feature parameters including the frequencies and its time variation of the frequency component candidate points. Also, as described in Applicants' specification, for example, at page 25, line 17-22, the claimed invention utilizes the time variation rate of the frequency of the frequency component candidate points for grouping the unit signals to identify a specific sound stream. This scheme is based on the fact that the time variation rate of the center frequency of the frequency component candidate points for the same sound source is continuous and usually does not include a rapid change. The claimed invention thus analyzes time variation rate of frequency (and amplitude) of the frequency component candidate points based on a spectrum of current frame.

At best, Tolonen merely analyzes time variation rate across the frames (previous, current and next frame), and fails to teach the use of the time variation rate of the frequency component candidate points for grouping the unit signals in a manner as claimed by Applicants. Instead, Tolonen uses pitch analysis result for grouping sinusoids corresponding to a harmonic tone, and analyzes pitch at a pre-analysis block. Even here, the claimed invention contrastingly analyzes pitch at the global layer using the features from a lower layer (a harmonic calculation layer). That is, the claimed invention does not analyze pitch by itself but analyzes pitch using consistency with harmonics as another clue.

Tolonen thus fails to disclose or even reasonably suggest Applicants' claimed invention, and it is therefore respectfully submitted that claims 1-7, 11, 12, 17-23, 27 and 28 are now patentably distinguishable over the cited art.

Claims 9, 10, 25 and 26 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Tolonen in view of Nakatani et al. This rejection is respectfully traversed with respect to these claims as amended herein.

These dependent claims are further limited from the respective independent claims as amended herein by such recitations as apparatus or process including "a sound source direction prediction layer....", or "a harmonic calculation layer for grouping frequency component candidate points having same harmonic structure...", and "a pitch continuity calculation layer for calculating a continuity

of signals using said fundamental frequency and said variation of the fundamental frequency at points of time."

These aspects of the invention as further defined in the dependent claims find no counterpart or reasonable equivalence in Tolonen, for reasons as discussed in the above Remarks. And, Nakatani et al. discloses relying upon directional information for segregating sources of fundamental frequencies of individual harmonic sounds, which can then be segregated according to extracted fundamental frequencies. At best, then, this reference is understood to rely upon the harmonic attribute of the sound source as well as the direction attribute for segregating sounds. However, Applicants are unable to find in the cited references any incentive or instruction, or even any motivation for combining such attributes of sounds segregation according to Nakatani et al. with iterative analysis scheme of Tolonen to in any way yield Applicants' claimed invention. It is therefore respectfully submitted that dependent claims 9, 10, 25 and 26 are now patentably distinguishable over the cited art.

Allowability of claims 13-16 and 28-32 is noted with appreciation. It is submitted that these claims depend from claims as amended herein that are now allowable, and therefore are also allowable to Applicants.

Reconsideration and allowance of all claims 1-7, 9-23 and 25-32 are solicited.

Respectfully submitted,
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